

## WHAT IS CLAIMED IS:

1       1. An apparatus for creating a graphical user interface to allow user requirements for a  
2       computer program to be written by an automated software production tool to be  
3       entered and converted to a formal language specification, comprising:

4               a software-generating computer programmed to:

5               display a plurality of dialog boxes and/or graphic screens each of which has  
6       boxes which can be filled in with data or menu selections, tools or icons which can be  
7       invoked to allow a user to enter information defining classes, attributes, events,  
8       relationships between classes, valuation formulas for events that affect the value of  
9       variable attributes and all the other information needed to define a conceptual model of  
10      the requirements a computer program to be written by said software generation tool  
11      must comply with.

1       2. A method for using a computer to display a graphical user interface to allow user  
2       requirements for a computer program to be written by an automated software  
3       production tool to be entered, comprising:

4               displaying a plurality of dialog boxes and/or graphic screens each of which has  
5       boxes which can be filled in with data or menu selections, tools or icons which can be  
6       invoked to allow a user to enter information and/or create graphic objects which define  
7       classes, attributes, events, relationships between classes, valuation formulas for events  
8       that affect the value of variable attributes and all the other information needed to define  
9       a conceptual model of the requirements a computer program to be written by said  
10      software generation tool must comply with; and

11               as a user fills in data or makes selections or creates graphic objects, displaying  
12      the data filled in or selected and the graphic object created in the location on the dialog

13 box and/or graphic screen where the data was filled in or selected or the graphic object  
14 was created.

1 3. The process of claim 2 further comprising the step of using a computer to  
2 automatically translate the data filled in or selected and/or graphic objects created into  
3 a specification for the computer program to be generated written in a formal language  
4 or other symbology which has predefined rules of syntax and semantics which can be  
5 used to verify that the specification so written is syntactically and semantically correct,  
6 complete and not ambiguous

1 4. A computer-readable medium containing instructions for controlling a computer  
2 system to display a graphical user interface through which a user can enter data to  
3 create a formal language specification defining a computer program, said specification to  
4 be automatically translated by a computer into a computer program that implements the  
5 requirements of said specification by:

6 displaying a plurality of dialog boxes and/or graphics screens and displaying  
7 boxes where data can be filled in, boxes where data can be chosen from a menu of  
8 choices, tools, icons or menu choices or some combination of the above in connection  
9 with display of said dialog boxes and/or graphics screens which allow a user to enter  
10 and/or select data and/or draw graphic objects to define classes of objects having  
11 attributes of fixed, variable and other types, and having services, and define  
12 mathematical and/or logical formulas controlling how services affect the values of  
13 variable attributes, and define relationships between classes, and enter data or draw  
14 graphics which represent all concepts necessary to complete a conceptual model of said  
15 computer program to be written.

1       5. The computer-readable medium of claim 4 further containing instructions for  
2       controlling a computer to automatically translate said specification into working  
3       computer code, by:  
4               controlling said computer to automatically translating said conceptual model into  
5       a specification of said computer program written in a formal language or symbology  
6       having predefined rules of syntax and semantics;  
7               controlling said computer to use said rules of syntax and semantics to validate  
8       said specification to verify that is syntactically and semantically complete, correct and  
9       not ambiguous; and  
10               controlling said computer to translate said specification into working computer  
11       code.

1       6. A process carried out in a computer for translating a formal language specification  
2       stored in said computer's memory and defining the requirements for a user interface of  
3       a computer program, into working computer code that can control a computer to  
4       implement said user interface, comprising:  
5               write code to display requests for a user name and password and receive inputs  
6       in response thereto and authenticate the user;  
7               write code to determine the privilege level of a user who has logged in and  
8       determine the classes of objects, attributes and services this user has privileges to  
9       access, retrieve the appropriate data from said specification and display the appropriate  
10       system view to said user;  
11               write code to link each service of each object to an appropriate object server  
12       program which can control a computer to carry out said service;  
13               write code to display query/selection search forms to allow users to enter data  
14       to define a search for data instances that satisfy the search criteria entered by the user

15 and conduct such a search when requested for all instances that satisfy the user-  
16 specified search criteria;

17 write code to determine automatically which services of an object can be  
18 invoked given the current state of the object and only allow those services to be  
19 invoked;

20 write code to furnish initial values for object-valued arguments of services and  
21 receive any user input arguments;

22 write code to check data type entered by a user for validity for the argument  
23 the data fills and make sure the entered data is within a valid range for the argument the  
24 data is intended to fill;

25 write code to check for dependencies between arguments, and, if a dependency  
26 exists, and user input data triggers the dependency, to enable/disable the dependent  
27 arguments or fill in values of the dependent arguments, and consequently triggering  
28 other dependency rules;

29 write code to invoke the appropriate object server code linked to a particular  
30 service when a user makes an input indicating a desire to invoke that service and to pass  
31 the object server code the appropriate arguments for the service;

32 write code to wait for results of execution of a service, and to display an error  
33 message if an error occurred, but, if no error occurred, to wait for further user input.

1 7. An apparatus for translating a formal language specification stored in said  
2 computer's memory and defining the requirements for a user interface of a computer  
3 program, into working computer code that can control a computer to implement said  
4 user interface, comprising:

5 a computer programmed to perform the following functions:

6 write code to display requests for a user name and password and receive  
7 inputs in response thereto and authenticate the user;

10 the appropriate data from said specification and display the appropriate system view to  
11 said user;

12 write code to link each service of each object to an appropriate object server  
13 program which can control a computer to carry out said service;

14 write code to display query/selection search forms to allow users to enter  
15 data to define a search for data instances that satisfy the search criteria entered by the  
16 user and conduct such a search when requested for all instances that satisfy the user-  
17 specified search criteria;

18 write code to determine automatically which services of an object can be  
19 invoked given the current state of the object and only allow those services to be  
20 invoked;

21 write code to furnish initial values for object-valued arguments of services and receive  
22 any user input arguments;

23 write code to check data type entered by a user for validity for the argument  
24 the data fills and make sure the entered data is within a valid range for the argument the  
25 data is intended to fill;

26 write code to check for dependencies between arguments, and, if a  
27 dependency exists, and user input data triggers the dependency, to display an  
28 appropriate dialog box prompting the user to enter input data needed to satisfy the  
29 dependency;

30 write code to invoke the appropriate object server code linked to a particular  
31 service when a user makes an input indicating a desire to invoke that service and to pass  
32 the object server code the appropriate arguments for the service;

33 write code to wait for results of execution of a service, and to display an  
34 error message if an error occurred, but, if no error occurred, to wait for further user  
35 input.

1       8. A computer-readable medium containing instructions to control a computer to  
2       translate a specification for a user interface for a computer program written in a formal  
3       language into computer code which can control a computer to implement the specified  
4       interface, by:

5               writing code to display requests for a user name and password and receive inputs  
6       in response thereto and authenticate the user;

7               writing code to determine the privilege level of a user who has logged in and  
8       determine the classes of objects, attributes and services this user has privileges to  
9       access, retrieve the appropriate data from said specification and display the appropriate  
10      system view to said user;

11               writing code to link each service of each object to an appropriate object server  
12      program which can control a computer to carry out said service;

13               writing code to display query/selection search forms to allow users to enter data  
14      to define a search for data instances that satisfy the search criteria entered by the user  
15      and conduct such a search when requested for all instances that satisfy the user-  
16      specified search criteria;

17               writing code to determine automatically which services of an object can be  
18      invoked given the current state of the object and only allow those services to be  
19      invoked;

20      writing code to furnish initial values for object-valued arguments of services and receive  
21      any user input arguments;

22               writing code to check data type entered by a user for validity for the argument  
23      the data fills and make sure the entered data is within a valid range for the argument the  
24      data is intended to fill;

25               writing code to check for dependencies between arguments, and, if a  
26      dependency exists, and user input data triggers the dependency, to display an

27 appropriate dialog box prompting the user to enter input data needed to satisfy the  
28 dependency;  
29 writing code to invoke the appropriate object server code linked to a particular  
30 service when a user makes an input indicating a desire to invoke that service and to pass  
31 the object server code the appropriate arguments for the service;  
32 writing code to wait for results of execution of a service, and to display an error  
33 message if an error occurred, but, if no error occurred, to wait for further user input.